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Technical Series

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A. F. B.

BULLETIN

No. 1 | Technical Series | January 1958

ADDRESSOGRAPH-MULTIGRAPH BRAILLE AND/OR INKPRINT DUPLICATOR

It is not the purpose of this report to make comparisons with other types of duplicating equipment, but merely to describe the Addressograph-Multigraph Braille and/or Inkprint Duplicator, tell what it is, what it will do and to give its significant specifications in order to assist interested parties in deciding whether it is a device which will fill their particular needs. It is felt that the potential purchaser armed with this kind of information is in the best position to determine whether his requirements for braille and/or inkprint publications can be met economically with such a unit.

The A/M duplicator is an adaptation of standard office inkprint duplicating machines. The adaptation was performed by the Addressograph-Multigraph Corporation in Cleveland, Ohio. The duplicator is a real contribution to the problem of supplying multiple copies of braille material. It should find use over a wide spread of applications ranging between the braille typewriter and the braille stereotyper. Obviously no plates (such as are required in the stereo press) result from this process which might be used for reprints at a future date. Its uses in reproducing braille would parallel those of duplicating inkprint material. Some examples of its use might be as follows:

a. Circularizing other agencies
b. Reproducing examination material for students
c. Providing test material
d. Intra-departmental dissemination information
e. Newsletter production
f. Providing combination (same copy) braille and inkprint

Several models are available, each of which is capable of producing excellent braille copy. The Foundation's contribution to the development of this duplicator was largely a matter of providing A/M officials with specifications for standard braille.

The unit is available in several models. The significant mechanical differences among them consist of the interchangeability of drums provided for in some models, the size of paper accepted by the different models and of whether or not the machine is manually operated or motor driven. If purchased as a braille duplicating unit, these machines can also be utilized for inkprint duplicating in both standard print and large type by the attachment of the necessary inking equipment and, of course, suitable inkprint type; conversely, those who may already possess the standard inkprint equipment can of course have it adapted for braille. The accessories are available from the manufacturer at extra cost.

The composition of the braille page is accomplished by a procedure which is virtually identical to that of the inkprint method, i.e. the braille type (slugs) is arranged in a tray which is divided into compartments, the most commonly used type being placed in the more convenient physical locations. In actual practice, the type setter proceeds as follows: the type can either be set into a portable guide or composing fork and then slid into slots on a drum on the machine or set directly onto the drum by means of a small guide. It can then be proofread directly on the composing fork or on the drum. When a page has been set, it is locked in place by means of a small metal locking strip. The machine is provided with a suitable holder for the paper supply which is hand-fed into the drum and roller system on all models. As may be imagined, the speed of type setting and distribution is determined by the skill and practice of the individual. However, in order to provide some general basis for determining the practicability of the device we can report, based on limited tests conducted by the company, that the time required for type setting and distribution is estimated to be one hour per page.

Pertinent Data: The type dimensions are standard, the dots are positioned on the "slug" to permit inverting should the supply of the given symbol be exhausted. Tests conducted by the company reportedly showed no wear on the type after 35,000 impressions. Maximum line width presently available on all models is 33 cells. Line spacing on demonstrator models was .500 inches. However, we are informed that production models will incorporate the standard .400 line spacing.

The following dimensions and weights are approximate:

Model	Weight	Length	Width	Depth
100	39 lbs.	18"	30"	12"
200	70 lbs.	21"	30"	12"
240	254 lbs.	22 1/2"	40"	45 1/2"

Models 100 and 200 are hand-operated. Copies are produced by turning the crank through several revolutions. Model 240 is motor driven. Model 100 accepts paper 9 inches wide by 12 inches in length. Models 200 and 240 accept paper 11 inches wide by 16 inches long. Models 200 and 240 are provided with an interchangeable drum feature whereby the printing operation can be carried on

while type is being set on another drum -- as for succeeding pages, etc. The power operated model has been found capable of producing up to 2,000 copies of quality braille per hour. No figures are available for production on hand operated machines, but it is estimated that 100 to 200 copies per hour are possible.

Comments: This is the only apparatus known to be available at this time which by the use of a simple attachment enables the device to perform two functions. All three models demonstrated produced very excellent braille. Service for this equipment should prove to be no problem since the A/M Corporation is an international organization. Additional information and prices may be secured by writing directly to the manufacturer at 1200 Babbitt Road, Cleveland 17, Ohio.

AMERICAN FOUNDATION FOR THE BLIND, INC.
15 WEST 16TH STREET
NEW YORK 11, NEW YORK

A. F. B.

BULLETIN

No. 2 Technical Series March 1958

AMERICAN FOUNDATION FOR THE BLIND
POLICY STATEMENT IN REGARD TO TECHNICAL RESEARCH
EFFECTIVE MARCH 1, 1958

This statement is formulated on basis of discussions at a meeting of the Technical Advisory Committee to the American Foundation for the Blind on December 13, 1957 and on additional individual consultation with members of the Committee.

The members of the Committee are as follows:

Karl M. Dallenbach, Chairman, Department of Psychology, University of Texas, Austin 12, Texas

Sherman M. Fairchild, President, Fairchild Recording Equipment Corporation, Long Island City, New York

William C. Geer, Owner, William C. Geer Laboratory, Ithaca, New York

Peter C. Goldmark, President and Director of Research, CBS Laboratories, New York, New York

Jansen Noyes, Jr., Treasurer, American Foundation for the Blind, New York, New York

Edward J. Poitras, Director of Engineering, Fenwal, Inc., Ashland, Massachusetts

Jerome B. Wiesner, Director of the Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts

Associate Members

Thornton C. Fry, Assistant to President, Bell Telephone Laboratories, Inc., New York 14, New York

Edwin H. Land, President, Polaroid Corporation, Cambridge 39, Massachusetts

PART I

BACKGROUND OF POLICIES IN SOUND RECORDING RESEARCH

Activities to Date

Prior to 1953, the Foundation did not know of any research in tape recording (magnetic or film) which, if successful, would lead directly to a much improved talking book. At that time, the Foundation had assumed that no substantial increase in grooves per inch would be possible and that 16 rpm was the slowest speed which could be used with low cost talking book playing machines.

A plan of research in the field of tape recording was approved shortly thereafter. This resulted in the employment of a specialist in July, 1955. The possibility of recording on film had been rejected on the advice of the Technical Advisory Committee prior to the start of the tape experimentation. This technician was therefore directed to give his full attention to multi-track magnetic tape recording. Through his own work and the investigation of the work of others, the AFB in December 1957 was in a position to produce within a six-month period the prototype of an instrument embodying the cartridge principle together with a suitable reproducer. It was believed that the resultant talking book system would be a substantial improvement over the present 33 rpm system and might even be more desirable than a new fine groove 16 rpm record system. However, the further development of this device was abandoned upon the emergence of a still slower-playing record, a 7 inch, extremely fine pitch, 8 rpm recording, the development of which was initiated upon the recommendation of the Committee.

Administrative Decision

The Foundation has decided that it will immediately and substantially reduce active research of its own on both tape and records for talking books. It will, however, support research by others looking toward a change to 8 rpm, 7 inch recordings for talking books; and upon proof of the feasibility of this speed and the development of a satisfactory prototype reproducer, it will assist in any appropriate way to secure adoption of the new records and players, with no more delay than is necessary to prove the merit of such a system.

Meanwhile, the Foundation will maintain a minimum staff to keep abreast of developments as a basis for rendering skillful assistance in cooperative field testing, record production, or other related projects. This staff would also have the responsibility for testing and evaluating devices submitted by inventors.

Reasons for Changes in Emphasis of Talking Book Research

A surge of commercial research in magnetic recording which started two years ago and was accelérated in the past year has, in the opinion of the Committee, already gone beyond the results obtained by the Foundation in its relatively limited effort. In addition, there are indications that future developments in the field of magnetic recording during the next decade would make almost immediately obsolete the best present system of tape recording.

The proposed 8 rpm fine groove records, pickup arms, and related reproducing mechanisms, are believed to promise soon a system of considerably greater economy and practicability.

The following are some of the anticipated advantages of the 8 rpm system over the present system:

1. The cost per recorded talking books of average playing time and number of copies would be tremendously reduced.

2. The decreased cost of producing a book would allow the recording of a considerably greater number of titles.

3. The reduced bulk of a smaller talking book would reflect a substantial saving in the circulation and distribution costs. It is estimated that the libraries would be enabled to store about six times as many books in the space now utilized for this purpose.

4. Savings resulting from the adoption of a more compact system is calculated to offset the cost of conversion within a short span of years.

5. It is further anticipated that the size of the record player will be reduced by 75 per cent, provided that future administrators do not attempt to accommodate the existing library of 12 inch discs on this same playback machine.

Long Range Considerations

In spite of the apparent advantage of 8 rpm over the present 33 rpm system and the substantial advantage of 8 rpm over the present best in magnetic recording, it is probable that some form of magnetic recording will surpass the feasibility of 8 rpm within the next ten to fifteen years. Such development should be watched by the Foundation and others concerned. It has been decided, however, that this probability will not affect the Foundation's present favorable attitude towards 8 rpm because:

The cost of changing to an 8 rpm system will probably be covered several times by the improved economy of the plan between now and such time as an improved magnetic system might be adopted.

Any later change from 8 rpm to magnetic recording will probably not show nearly as great a percentage of reduction in cost as appears almost immediately possible in the change to 8 rpm.

PART II

FUTURE DIRECTIONS FOR AFB TECHNICAL RESEARCH ACTIVITY

To summarize, the American Foundation for the Blind, because of the foregoing considerations, will reduce considerably its own activities in the development of sound recording and reproducing apparatus. It will, however, maintain a high degree of interest in, and continue to conduct occasional studies of, all progress in the general field of sound recording and reproduction in order to keep itself well informed and to extend the benefit of its objective knowledge on behalf of blind persons in any appropriate way or situation. For example, the Foundation is especially concerned even currently with experiences in the use of tape, because of its consulting role, through the American Foundation for Overseas Blind, to the developing international library service operating in Europe and predicted for South American countries, where tape is the basic media. It is believed that the Foundation may maintain its informed position through the courteous cooperation of commercial laboratories. If proper contacts are nourished such laboratories undoubtedly will be disposed to be helpful.

In view of reduced direct activity in this area, therefore, the American Foundation for the Blind may now take stock of its capacity for research and development in other areas of technology which might produce mechanical or electronic appliances of value in reducing the problem of blindness to individuals and to society. The following is a general indication of areas in which greater emphasis will now be placed with gradual increase in both tempo and quantity as budget permits:

1. The long-delayed publication of a technical information bulletin service.

This will entail an improved system for collection of data from all parts of the country and the world, the systematic indexing and consolidation of such information, and the editorial preparation of such bulletins. For many years, the field of technical interest in blindness has indicated that such a service would be invaluable for continuing research by an institution in the specialized blind field, or for a specific technical project for which is required comprehensive background information. (This bulletin service has already been initiated.)

2. Research activities.

Exploration of possibilities for development in the following areas:

a. Mobility Devices--instruments intended to assist a blind person to move about independently and with greater ease.

b. Reading Machines--devices intended to reproduce through the principle of electronic scanning the printed page in audible or tactile form which can be instantaneously read to a person without sight. Also devices designed to produce braille from other media such as punched tape, magnetic tape, etc.

c. Braille Duplicating Equipment--devices for multiple copying of braille material, including the vacuum forming technique.

d. Braillewriters--the type of unit which can vary from the simple principle of the "slate" to improved models of writing machines such as the Perkins braillewriter and the Marburg braillewriter.

e. Optical Probes--devices expected to contribute to greater success in various vocations by aiding in the following operations:

Electronic meter reading,
determining the location of the pointer on weighing scales,
determining recording level by reading the neon on level indicator provided on recording apparatus,
determining on or off conditions of lights (room and signal),
letterhead and margin location, and color distinction.

f. Deaf-Blind Communicators--devices to assist in overcoming the communication barrier between those who are deaf-blind and their nonhandicapped associates.

g. Pocket Tape Recorders--devices which will enable a blind person to take notes at conferences and conventions, record material for business and study purposes and provide additional means for exhange of correspondence.

h. Optical Aids--devices which makes possible the use of certain types of residual vision.

Continuing research on the premises on literally scores of aids such as:

a. Tools or devices which will assist the blind person to make a success in various vocations--levels, micrometers, saws, planes, etc.

b. Kitchen aids--measuring devices, timers, utensils, etc.

c. Recreational items of various compositions anticipating greater use of plastics and electronics.

d. Medical instruments--adaptation of eye wash applicators, syringes, etc.

e. Education aids--maps, abacuses, etc.

f. Iconoscope applications--to determine the practicability of the iconoscope in securing information from TV screens for those with limited vision and in providing tactile information to totally blind persons.

Detailed schedules of activities in all the foregoing categories will be a routine part of annual budgeting. In addition, the Foundation will consider the support, with cash grants, of technical developments possibly not carried out on Foundation premises. These could however, still be interpreted as Foundation projects.

A. F. B.

BULLETIN

No. 3 Technical Series May 1958

OPTICAL PROBE FOR BLIND PERSONS
DESCRIPTION AND REPORT OF FIELD TESTS

The development of an optical probe for blind persons was principally due to efforts of some blind technical men who recognized the need for a device which would assist them in the performance of certain tasks, such as locating the position of pointers on instrument meters and weighing scales, and determining the on-and-off condition of control or signal lights. The probe reported on here is composed of a lens, photocell, tone generator, battery and earphone piece. Supplemental equipment furnished includes a light source and attachments to adapt the device for certain uses. The tests were conducted by the American Foundation for the Blind in 1957.

The prototype of the particular probe tested was designed by the late Dr. Clifford M. Witcher of the Massachusetts Institute of Technology and an assistant, Mr. LaMar Washington. It was subsequently redesigned in compact form by Dunn Engineering Associates Company of Cambridge, Massachusetts, with the assistance of Mr. Carl Hurtig, a transistor expert of MIT. It was named the Audi-Vis Probe. A technical description as written by the manufacturer is given at the end of this report.

The device functions in this manner. The lens gathers light and focuses it on the photocell which in turn supplies the necessary signal voltage to the input of the tone generator to cause it to produce at its output, a voltage sufficient to be heard as an audible note in an earphone. Variations in the amount of light admitted to the photocell result in varying pitches of the audible note. Light sources may be incident or reflected. Examples in application are:

> INCIDENT LIGHT - In using the probe to detect incident light conditions - which is light that falls directly upon an object (in this case the lens of the probe), the internal light source provided is NOT used. *Specific examples* are room lights, control and signal lamps.

In practice the probe would be aimed in the general area under scrutiny and slowly moved about with a scanning motion - a rise in pitch indicating an increase in stimulation of the photocell due to a higher level of illumination.

REFLECTED LIGHT - In determining meter pointer position, locating margins, etc., the instrument makes use of reflected light which is provided by a lamp as an attachment to the basic device.

In practice the user would place an attachment on the probe which would hold the light and position the probe at the proper angle to the work surface with relation to the lens and then move the probe over the surface being examined. In the case of locating the position of a letterhead or margin, a lowering in pitch would indicate that the amount of light reflected was being diminished due to the lettering being interposed between the light source and lens, thereby reducing the amount of light available to stimulate the photocell.

In structuring the field tests, forty-five individuals engaged in a wide variety of occupations were chosen in order to secure information which could be regarded as representative. Occupations included:

Electronics
Office Work
Engineering
Telephone Switchboard
Executive
Chemistry
Psychology
Therapy

No suggestions as to applications of the probe were included in the tests - this being left entirely to the ingenuity of the user. Some applications, in addition to those already mentioned, for which the probes were tried with varying degrees of success were:

Orientation
Liquid Levels
Auto Lights (oncoming)
TV Servicing
Color Differentiation
Pattern (clothing)

A review of the forms returned from the field showed the device to be of considerably less value than had been anticipated. For example:

1. Few people could read meters.
2. Neon light recorder volume level indicators could not be read.
3. Office workers could not dependably tell whether the typewriter ribbon was working or where the print had stopped.

Many suggestions for improvement were received, some of which are as follows:

1. Build the photocell and optics in a compact housing and attach to a separate power source by plug-in cables.
2. Provide better auxiliary light source.

3. Equip earphone with detachable connector cord.
4. Provide better or longer lasting power source.
5. Use improved optical system to insure better resolution.

Although the results of the tests show the device to be of little value except in a small number of specific applications, the individuals involved demonstrated enough interest to warrant the expense of producing a small number of probes modified in accordance with the recommendations received from the participants in the tests. Therefore, it is planned to produce or have produced five redesigned instruments and to subject these to the same kind of tests to determine whether or not increased range and flexibility will make it worthwhile. The progress of this project will be reported on in future bulletins in this series.

Manufacturer's Technical Data: - The Audible Vision Probe generates a tone whose pitch is proportional to the intensity of the incident light on the tip of the probe or, using an internal light source, to the reflectivity of an object placed beneath the probe. Physically, it consists of a fountain-pen-sized tube containing the tone generator, flashlight battery and bulb, and lens. A hearing-aid type earphone conveys the audible information to the user.

The tone generator consists of a transistorized multivibrator, using two 2N133 transistors, whose frequency is controlled by a circuit including a CL-2 Cadmium Sulfide Photocell and a 600C Silicon Diode. The internal light source is a pre-focused penlight bulb, Type 222. A single penlight 1 1/2 volt dry cell, Type EP-921 provides all the power for both the tone generator and the internal light source. The life of the battery using the internal light source is 5 to 10 hours; when the internal light source is not used (for example, when viewing distant light sources), the battery life is 200 to 400 hours.

A lens system is provided which will focus the probe at infinity for viewing distant objects, or at a fraction of an inch for reading meters and the like. A number of attachments are provided with the instrument.

The probe is 4 5/8" long by 3/4" in diameter, and weighs a little less than 4 ounces

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A. F. B.

BULLETIN

No. 4 Technical Series December 1958

EXPLORATION OF 8 1/3 RPM AND OTHER RECORDING SPEEDS

This past July the Foundation was asked by the Chairman of that group of the American Association of Workers for the Blind membership which is interested in publishing for the blind, by any and all methods, to speak on the subject of 16 2/3 rpm recording as applied to the Library of Congress Talking Book Program. The essence of the report follows:

> It was reported that experiments on 16 2/3 rpm had been conducted and that the results were highly successful, but that experiments with 8 1/3 rpm, under a research and development contract with the Library of Congress, looked so promising that it appeared wise to officials of the Library and the Foundation to explore 8 1/3 rpm exhaustively before making a final decision as to the speed best suited to the Talking Book Program.
>
> In order to give as clear a picture as possible -- the more recent research relative to this Program conducted to date was set forth in chronological order. The term "more recent" is used since research in low-speed speech recording has been going on for many, many years. Indeed, some British Talking Book records of the late thirties revolved at 24 rpm. But -- to get to the more concerted efforts of persons interested in providing recorded reading material to blind persons in a more economical and compact form. .
>
> At the November 1956 meeting of the Foundation's Technical Advisory Committee, the Committee suggested that we subcontract for development of an 8 1/3 rpm record. They also

recommended that we discontinue active work in the area of extra long-playing Talking Book records. In accordance with the policies set forth in the American Foundation for the Blind's technical bulletin #2, it will be noted that in general these recommendations were followed. (This bulletin in essence stated that -- in view of commercial concentration in the fields of magnetic tape recording and disc recording, the Foundation might better direct its technical staff and resources to looking into devices which might be of some value to blind persons which were not currently being explored so intensively commercially). However, much of the groundwork for a highly compacted Talking Book record had already been accomplished in our own laboratory, and in order to complete the project launched early in 1957, an official exception to the newly established policy was granted in order to complete the tentative standards for a record which are set forth below:

1) 12 inches in diameter
2) Recorded at 8 1/3 rpm
3) Crossover, 350 cycles
4) Recorded at between 350 and 400 lines per inch
5) Cut with standard microgroove recording stylus
6) Starting diameter 11 1/2 inches
7) Terminal circle 3 3/4 inches
8) Recording velocity 2 cm per second at 1,000 cycles per second
9) Standard center pin size
10) Record thickness approximately .050 inches
11) Approximate record weight 5 1/2 ounces
12) 3 db of diameter equalization at each of the following diameters: 9 1/4 inches, 8 1/4 inches, 7 1/2 inches, 6 3/4 inches, and 6 inches.

Records made with the above specifications have a playing time of three hours per side, thereby enabling the average book to be recorded on two double-faced 12 inch records as compared to the present thirteen 33 1/3 rpm records required for the same material. Should this record prove practical and desirable from all points of view, there is this to report regarding the comparative economy. Preliminary estimates of the cost of producing the average book ordered by the Library of Congress in this form indicate that we can make them available in suitable shipping containers at a cost of not more than $4.50 per book, provided quantities of 250 to 300 books are ordered of each title. This cost for a two-record set compares with $22.10 in cost for the same amount of recorded material currently being supplied to the Library in the 33 1/3 rpm version in thirteen records when ordered in average quantities of 175 copies per book. The $4.50 cost would be reduced to not more than $2.75 per book if ordered in quantities of 2,000 copies or more of each title.

We were happy to learn through an information bulletin published by the Library of Congress on June 23 of this year that the Library had launched a research project to be conducted by Recording for the Blind,

Inc. for the purpose of field testing 8 1/3 rpm records and players which are to be produced by CBS Laboratories.

The question of "What of 16 rpm?" and, for that matter, "What of 8 rpm?" can only be answered by the adoption of one or the other by the Library of Congress. Obviously, neither can or should be adopted until the Library has carried out the thorough field testing which any major departure from a standard so long established necessitates.

There followed a demonstration of an 8 1/3 rpm record, a 16 2/3 rpm record and the 33 1/3 rpm record currently in use in the Talking Book Program. First, the 8 1/3 rpm record was played on a highly modified commercial phonograph. This machine was not represented as a prototype for use in the Talking Book Program but merely to show some of the possibilities of reduction in cost, weight, and size over the Talking Book machine currently being manufactured for the Program. Next, the same 8 1/3 rpm record was played on a Model D Talking Book Reproducer modified only to give a turntable speed of 8 1/3 rpm and 33 1/3 rpm. (Note: Model D Reproducers are equipped with a dual speed turntable capable of 16 2/3 rpm and 33 1/3 rpm. The modification was effected by sacrificing the 16 2/3 rpm speed.)

The Library of Congress recently ordered a 16 2/3 rpm recording of a book previously recorded at 33 1/3 rpm -- this was played on a standard Model D type reproducer. Finally, the 33 1/3 rpm version of the 16 2/3 rpm book was played. Questions on the presentation followed. This concludes the presentation given at the AAWB Convention.

The release of this bulletin was delayed pending the outcome of wear tests commenced in the Foundation's laboratory shortly after the Convention demonstration. These tests compared the 8 1/3, 16 2/3, and 33 1/3 rpm recordings from the standpoint of the reader in terms of signal to noise ratio, through critical listening tests after progressive playings of 25, 50, 75 and 100 times. No elaborate electrical measurements were included since it was felt that this kind of information is of little significance to the reader. Uniformity of test equipment and procedures were given primary consideration. The results of the tests are as follows:

33 1/3 rpm record - after 100 plays
Negligible decrease in signal to noise ratio resulting in no noticeable loss in intelligibility.

16 2/3 rpm record - after 100 plays
Evidenced little decrease in signal to noise ratio with no significant loss in intelligibility.

81/3 rpm record - after 25 plays
Slight decrease in signal to noise ratio --slight impairment of intelligibility.

81/3 rpm record - after 50 plays
Noticeable decrease in signal to noise ratio -- increased impairment.

8 1/3 rpm record - after 75 plays
Significant decrease in signal to noise ratio -- considerable impairment of intelligibility.

8 1/3 rpm record - after 100 plays
Greatly deteriorated signal to noise ratio -- extremely poor intelligibility.

From the above, it is to be concluded that in order to preserve an acceptable signal to noise ratio and to be assured of reasonably good intelligibility over a sensible predictable record life, a minimum linear velocity must be maintained. This would appear to be approximately two inches per second if practical record life is to be expected. It should be borne in mind that the test results reported above deal specifically with one type of experimental 8 1/3 rpm record. It is not to be concluded that this report constitutes a final rejection (in our opinion) of 8 1/3 rpm recording in general; rather it points up the need for further experimentation in this particular speed. As time and funds permit, steps will be taken to further explore recording and reproduction at this speed in the interest of ultimately developing the optimum record commensurate with economy and practicality.

Also, it should be remembered that these conclusions are based upon the reproduction of the 8 1/3 rpm record herein described on Talking Book reproducers currently in use in the field.

AMERICAN FOUNDATION FOR THE BLIND, INC.
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A. F. B. BULLETIN

No. 5 Technical Series April 1959

SEMINAR ON TECHNICAL RESEARCH AND BLINDNESS

A two and a half day session was held at the headquarters of the American Foundation for the Blind on December 8-10, 1958. A point of departure is that the bulk of the actual participants were engineers, physicists and mathematicians who are blind and actively employed in their field.

This bulletin summarizes in brief the two and one-half days of intensive exploration and discussion touching on virtually every facet of technology which has been, and which currently is being explored, in the search for means to alleviate some of the difficulties brought about by blindness.

The principal purpose of the seminar was to elicit from an informed group-oriented on the one hand to the technical problems, and on the other to social service considerations, opinions and, if possible, recommendations as to how the Foundation might best contribute to the solution of the problems of reading, mobility and aids in general.

How well the purpose has been served cannot be judged by the A.F.B. alone. Those who attended felt their time well spent. Indeed, they were in accord to a man with the remarks made by the sp[illegible]er at the conclusion of the meeting.

This information then is shared with you for whatever assistance it may be in connection with your particular endeavor. Your views and/or suggestions on the content are invited.

Program Participants

Miss Georgia Lee Abel, Consultant in
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Mr. J. Albert Asenjo, Specialist in Vocational
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Mr. M. Robert Barnett
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Monday Morning Session - December 8

Greetings.

Mr. M. Robert Barnett in his address of thanks and welcome pointed out that the Foundation's charter mandated it to do all that is possible through technical research to resolve problems resulting from blindness. It has done extensive work, in the early days, on braille and has had an active program in the talking book area over the past quarter century, as well as in the development of other equipment such as the Tellatouch deaf-blind communicator. It has made grants for research projects and also received funds for work in its own quarters such as contracts with the Library of Congress for development work on sound recording and reproduction.

The Foundation has, it was said, been conservative in its evaluation of proposed research on such devices as reading machines, mobility devices and braille production methods. It has to proceed with an announced intention to take a more active role in such directions. If, from these talks, a group opinion on specific subjects can be achieved this will be helpful.

Communications Problems

1. Optical Probes. (See A.F.B. Bulletin, Technical Series No. 3, May, 1958)

The Foundation financed construction of fifty optical probes by Dunn Engineering Associates of Cambridge, following a design of the late Dr. Clifford M. Witcher of the Massachusetts Institute of Technology and his assistant Mr. LaMar Washington. This is a photocell device which converts light intensity into a pitch change in an oscillator. The more light it receives, the higher the pitch. A sample was passed around, together with a model with a separate power supply and light source for gaining information on reflections from printed pages (margin width, letter-head position) meters, etc. The Hear-a-lite, a similar device distributed by the Batavia Lions Foundation of Batavia, New York, was also mentioned.

Participants who had participated in the field test said they had found it useful for locating print, reading some meters, checking pilot lights.

The following report from the Foundation's Laboratory was read:

"The Audi-Vis probe manufactured by Dunn Engineering Associates, Inc. would be of more use if it could indicate the flashing of neon recording level indicators employed by many of the non-professional type of tape recorders. Since this probe has been of little or no use in this respect, an attempt was made to discover why.

"The cadmium sulphide photo cell used as the light sensing element has good response at the red or low end of the color spectrum, so it was thought that a higher voltage on the probe would greatly increase its sensitivity. A power supply was constructed to be substituted for the 1-1/2 volt battery. The current drawn from the battery is less than a half of a milliampere. An increase to nine volts caused the current to be over 4 ma, which is too high to risk a further increase without circuit changes.

The loudness of the sound increases proportionally with the higher voltage, but the frequency of the tone is only slightly changed with the same amount of light. This seems to indicate that the sensitivity of the probe is not substantially improved.

"A flashing neon bulb can now be detected, if extreme care is taken to shade the cell from all external light and placing the neon bulb up into the probe next to the cell, and then only flashes of long duration can be detected. The Clairex CL-2cadmium sulphide cell has a time constant of 1 millisecond with 100 footcandles of light, and 150 ms at 1 footcandle. The light given off from a small neon bulb is much less than 1 footcandle, therefore the time for the cell to respond at this level is too long to indicate the pulses from a volume indicator.

"By using the internal light source provided, very fine lines on paper can be detected by a decrease in frequency of the tone heard in the earphone; however, a line 1/32 of an inch wide appears to be much wider when the probe is moved over it. This shows that the line is only a small part of the total picture covered by the optical system. In order to get a clearer picture of indicator pointers, signature lines and the like, a much smaller area has to be covered at a time. This probably can be done by better focusing and masking in the optical system."

There was general agreement that this type of probe deserves further development to increase sensitivity and dependability. Some felt portability was desirable, while the majority felt that a separate power supply and breakdown of the elements for easier application to specific tasks had more promise. It was pointed out that a probe specifically aimed at meeting needs of typists would have broad value.

It was pointed out that a probe may also be regarded as a potential input to more complicated circuits which might lead, for example, to some sort of reading machine. It was felt that in its presently conceived form it would probably not open too many jobs, but might facilitate many.

There was disagreement as to the techniques of field testing, some feeling that a small sample unde carefully controlled conditions would yield more meaningful conclusions. It was recommended that further work be pursued.

Afternoon Meeting - December 8

2. Electronic Notebook.

No prototype of this unit exists. A compact, low cost, battery operated tape recorder was shown as one possible type of note-taking instrument. It was agreed that such a unit has too many drawbacks in terms of accessibility of material. The instrument proposed would employ multiple tracks on magnetized cards which can be passed under a head which covers a track at a time. An estimated nine seconds of information could be recorded on each track which might for the sake of simplicity be recorded at 1/16 th inch from those adjacent. Then there would be space for 16 tracks per inch.

The advantage over tape reels is that the desired data may be reached rapidly. The advantage over discs is that the unit can be more compact and that individual notes can be deleted when not needed. The advantage over braille is greater speed of note-taking, no learning process, and lower bulk of files. It was suggested that the machine might incorporate a 6-cell slate for labelling the cards. It was suggested that the microphone might be an integral part of the unit and that a governor control might eliminate the need for a motor drive to transport the card.

It was generally agreed that such a device would be of great value for many people for taking short phone messages, jotting down data of meetings and conferences, noting addresses. It was hoped that it could be kept low in cost, preferably under $80.00.

3. Mathematical Aids.

Two models of an abacus were shown. One was a standard Japanese Soroban which has been modified by I. Miyato of Sao Paulo, Brazil. It had four beads per column in the units section and a single bead in the fives section and had been damped by the addition of gum and sponge rubber to prevent accidental shifting of the beads. The other was a new design of Martin Mahler of Mah-Zell Precision Products in which grommets were fitted onto bolts extending above and below a divider. This also incorporated the one-four bead arrangement. The Japanese version was preferred.

There was complete agreement that the abacus should become an integral part of the curriculum for all children, blind as well as seeing; but not to replace any existing methods. There was disagreement as to when it should be introduced and concern lest it become a crutch. It was pointed out that the device does not do arithmetic but is merely a form of notation, which permits rapidly setting down results and altering them.

Interest was expressed for the American Printing House for the Blind. If a group of blind individuals found a given form useful, their reports could be submitted to the A.P.H. Tangible Apparatus group and if they approved, then A.P.H. might put out an abacus for the schools.

The value of the abacus to the adult blind was discussed. Here it could serve as a cash register in the sense that it could be used to keep a running total of daily sales, as well as an adding machine. This market will be opened immediately if good instructions can be provided; whereas the school market must await acceptance and training of the teachers. It was suggested that initially only addition and subtraction need be covered and supplementary instructions could later be made available for more advanced functions.

Number of columns needed, bead size and spacing, and techniques for damping were discussed. Some felt that a six to seven column version would be sufficient with additional units purchased when more than one factor had to be recorded.

There was agreement that a damped version was needed. Some felt that the Foundation ne[illegible] only supply sources for an approved model and give instructions for damping the beads. Most felt the cause would be best served by offering the adapted unit with braille instructions as a package.

This would place the abacus in the catalog where it would be continuously brought to the attention of individuals.

A Keuffel and Esser Log-Log Decitrig Slide Rule which had been modified by the manufacturer was shown. One of the participants had used one and found, on the four occasions he used it, that he achieved two place accuracy which was adequate for his purposes. He offset the wire index on the slide by the thickness of his fingernail to read the divisions. Unfortunately, the company has since reported discontinuing it's production in the modified form.

A sample of a Nomograph for multiplications and division was shown. This had horizontal, vertical and diagonal log-log scales. The consensus was that nomographs are exceedingly difficult to read by touch.

Methods of preparing mathematical tables were discussed. There are in existence means of decreasing their bulk radically. It was felt that steps should be made to put such tables into production. Techniques were demonstrated for using available pocket adding machines without sight. If a number is to be added in a row and the slider will not go all the way down, the stylus is held in place and pulled back to the top where it can be transferred to the next row. Answers are read by pulling each column back a unit at a time till the slider no longer can be moved.

Tuesday Morning Session - December 10

Braille Problems

1. Card and Tape Storage.

The work I.B.M. has been doing with punched tap braille was described in some detail. This is not primarily directed to storage but rather to proof reading. An eight hole code is provided to care of pagination and a redundancy code. A first tape is prepared, followed by a verifying operation which yields a second tape. Where discrepancies occur a decision is reached as to the proper presentation. This tape can now operate a stereotype machine at a rate of about 30 words a minute. Speed is not an important consideration. The tapes in the 8-hole code can readily be duplicated should they be needed abroad or elsewhere, and provisions are available for making a

6-hole tape from an 8-hole code master should a reader come on the market for converting the punched tape into tactile braille.

This system is still too young for cost estimates to be established. It is hoped that a reduction of cost will result and it seems assured that greater accuracy will be obtained. It is felt, however, that the zinc plates can be stored more cheaply than the punched tape. It appears that the tapes can be punched more rapidly than the stereotyper will operate. The Printing House's best transcribers can outrun the stereotype, but not the tape punch.

Punched tape for operating a stereotype is not satisfactory for use with the I.B.M. tape reader or similar equipment since the title and page number appear on every page, and footnotes may appear in mid-sentence, as it were.

There was some discussion of details of the I.B.M. tape reader, and the Foundation's test project on this approach was reported. Magnetic tape was discussed as a storage medium but was regarded as currently too costly. It was agreed that both punched tape and magnetic tape could be employed in this manner, but there was no conclusion as to the desirability of exploring this at the present time.

Tape translation systems were discussed. The need for a teletype to Grade I braille translator seems to have been superseded by current work which hopes to go directly from such codes to Grade II braille.

I.B.M.

I.B.M. has been programming a 704 computer for this purpose. So far the program has aimed at translating braille into print for proofreading. The goal is to have an output of some form to operate a stereotyper, eliminating the human being once coded tape or cards are fed into the machine.

Mr. Nemeth's work on programming the I.B.M. 650 computer, which is less costly and mo[illegible] readily available, was described. At its present stage no punctuation marks or marks of composition are integrated into the program, but only half the storage capacity of the 650 has been used. Mr.

Nemeth is confident that his program can incorporate all signs, rules and exception and can produce Grade II braille on punched cards as rapidly as the best stereotype operator can currently emboss plates. In this instance, a 735 word text would require 15 cards for storage.

An unsolved problem is hyphenating at the ends of lines. Mr. Nemeth is confident that sufficient storage will be left to handle this.

The role of Stanford University Research facilities was discussed. This group does not consider itself as competitive with I.B.M. and would prefer to consider whether a special specific purpose device might best suit the needs. It was felt that a Grade II braille device is not beyond reason, and that a recognition machine might later be added which would make access to the printed word rather straightforward. No active work has yet been undertaken.

In survey, it was stated that proofreading as a problem has been largely simplified by I.B.M. equipment. This leaves the basic translation of full-spelled material (on tapes, cards, or magnetic tape) to Grade II. Active work on this is progressing. The ultimate goal in character recognition is one which seems still to be at some distance from complete attainment.

Afternoon Meeting - December 9

Tools for Better Jobs

A brief description was given of the research and demonstration program of the U.S. Office of Vocational Rehabilitation which, since 1954, has spent about $800,000.00 solely on research and demonstration projects relating to the blind and blindness. Such grants covered a study of professional standards and pay scales in agencies for the the blind, a survey of research work, development of the Franklin Institute tactile cane, a study of the potential for teaching the use of sound cues to the newly blinded, development of a tactile scale to measure performance on vocational aptitude tests, investigation of optimum time at rehabilitation centers, research in depth on attitudes of the sighted public on blindness, development of revised tests for blind subjects and studies of home industry.

A number of grants have also been made to establish optical aids clinics. Six have been established and two more are under consideration. In all, twenty-six projects relating to blindness have been financed by the Office of Vocational Rehabilitation.

O. V. R. does not support the entire cost of such projects but may supply two-thirds to three-quarters of the funds on a formula determined by the National Advisory Council. There is particular interest in well-thought out imaginative projects with practical applications to opening up new vocational opportunities.

Last summer a meeting was called of a committee composed of state directors of Vocational Rehabilitation, representatives of the Blinded Veterans Association, the American Foundation for the Blind, and organized counselor training programs. Here certain needs were recognized:

1. The need for more thoroughly trained placement people.
2. For better training for travel instructors.
3. For better training in actual business management (vending stands).
4. Expanded and improved training facilities for home teachers.

Extended discussions of inadequacies of the present placement program followed. The problem of soldering came up. The average placement officer has no concept of the correct techniques. Indeed a serious gap exists between the development of a tool or technique and the people who may require knowledge on the subject. It was revealed that not one of those present had been helped by placement officers in securing positions and some had been discouraged. Even the Foundation's catalog of aids for the blind is not known to many training and placement people in agencies for the blind.

1. Secretarial Aids.

In this area techniques exist to handle virtually all problems. While erasing devices have been proposed, it was felt that existing techniques are preferable.

Similarly, for filling out forms which are not too complicated, a technique exists for line spacing by half or quarters so that good alignment can be maintained throughout. Templets may also be provided for persons with good handwriting and, as was pointed out, several templets might be provided for a single form where spacing was close. Requirements for filling out many forms would probably rule out a job for blind persons without useable residual vision.

The question of Stenotype or other dictating machines of that nature was raised. A French design was described in which small vertical and horizontal rows of braille-like dots serve as reference and standard sized braille dots can be clustered about. However, dictation speeds of only 150 words could be reached and this can be done on the British Shorthand machine for which no new skills need be acquired.

2. Switchboard Operation.

The present practice by the telephone company of charging monthly rentals of from $15.00 to $35.00 for the use of a solenoid braille attachment appeared to many to limit placement opportunities. The Federal Civil Service Commission has recently agreed to defray these costs for Government employees and to open Switchboard Operation to blind people. This, it was felt, may perpetuate the existing techniques.

Bell Laboratory experiments with a photocell device were described. This is a thimble-mounted unit. It was felt that a multiple bank of photocells in a moveable transport might provide a workable solution which, since it need not be attached to the equipment, might be acceptable. It was felt that this merited further exploration. It was recognized that adaptations used abroad are not applicable to American equipment.

3. Measurements.

A carpenter's level was shown, using a pendulum and a 360° protractor. Design changes were discussed to reduce friction as well as construction cost. Other ideas were proposed such as suspending an inverted "T", the use of a flush gauge with mercury-activated bellows to shift the plungers. (Note: these principles have since been combined in a model which shows a difference in reading when a sheet of paper is placed under one end. Refinements in design are under way).

The question of tools needed in organ repair work was raised. A proposed device for tuning was described but characterized as unneeded, the more so since it was slower to use than good technique. The value of the existing auditory circuit analyzer was cited.

In general, it was felt, tools and techniques exist to carry out a wider variety of jobs than has been realized. A rotomatic rule, for example, can be easily modified to serve as a pump thrust gauge. Most industry does a certain amount of special tooling in any case, Timken Roller Bearing, Columbia Electronics Research Laboratories, Minneapolis Honeywell, International Harvester, and I.B.M. were mentioned as companies who have made special equipment for blind employees. The Foundation has worked with equipment manufacturers in devising simple modifications. There is no general market for such specialized equipment, but with ingenuity on the part of all involved, tools or techniques usually result. The problem is how to assemble and diseminate such information.

Another difficulty, it was pointed out is that one man will need a tool while another does better with a skill. Coffee pouring in a wet stand and liquor dispensing in a tavern , were mentioned as instances where a tool had been devised but which was later discarded as a skill developed.

In the area of spreading information braille vacuum formed masters were discussed. The American Printing House for the Blind is now printing from two .0075 mil vinylite masters vacuum formed from a hand-transcribed paper original. Present cost is about 30 cents per page for the two masters. Runs of 20 copies are certain, but 500 have been run. Slate braille is not adequate and on braille prepared on a writer there is a loss in dot height of 20% but the braille is still readable. A flat bed press is required at present. Roller presses do not provide enough pressure.

A catalog is being assembled of available material up to the end of high school. It was felt that a means should be found of extending this to the college and professional level.

Plastic final copies on shiny and matte surfaces were shown. It was felt that they might have value in certain areas, say for tables or for diagramatic material. Both processes were endorsed for further study.

Wednesday Morning Session - December 10

Mobility.

The Cleveland project to try to develop means of training newly blind individuals in the better use of sound cues was discussed. Stereophonic tapes are employed and one objective has been teaching localization of sound sources. It was questioned whether this would be possible or even desirable with this technique. Much work has been done at Stamford University on such problems.

The role of the human being was brought out, his ability to select from the overall sound patterns relative data. There was discussion about other things that could be done to sound to alter its value in the learning process. It was felt that such studies could be continued and expanded.

The basic past approaches to guidance devices was examined. Their aim appears to be primarily at obstacle and step down detection, whereas the main concern is orientation. Again it was stressed that too little is known as to what cues the traveler uses and how he gains access to them. An analogy was drawn to ships at sea or hikers in forests where no orientation cues may be available and where invisible cues are called on. The value of detail maps and maps of larger areas was mentioned.

The fact that most guidance devices had been conceived to pick up data on only small areas was placed in the light of the difficulties people with severely restricted visual fields have in travel. Some such with 20/20 in the tiny center have dog guides. Whether sonar or infra red cells could be used effectively is not known.

Status of the Franklin Institute cane was reviewed. This is about to be put to test in five eastern states.

The feeling seemed general that more needed to be known of the human engineering factors before any extensive new projects of a hardware nature should be undertaken.

Reading Machines

Most of the work in this area is currently being sponsored by the Veterans Administration. The projects break down into various phases of the overall problem. At Haskins laboratory there are two projects: 1. speech analysis, and 2. speech synthesis. The first is trying to reveal the essential components of speech, and the second is establishing rules for setting down on film the black lines and spots which results in phonemes. The hope is that when a recognition machine has been perfected (probably for commercial uses) an output system may be ready. The plan is to build in tape, an electronic dictionary of 6000 words. If a word not in the dictionary is encountered it would be spelled out. Metfessel in California is working on spelled speech and his findings would be applicable here.

The work at Battelle Memorial Foundation represents an attack on a simpler and different front. It's output produces chords of tones and has no resemblance to speech. The user must be trained to interpret. The feeling is that an armamentarium of devices may be required since what may be usable by one person might prove useless to another.

The National Research Council in Canada has been working on a tactile reading machine. The first goal is a tactile presentation corresponding closely in form to the audio output of the Battelle device. In other words, instead of a chord with so many tones, there would be a tactile line with so many pins. Whether such presentation is readable cannot be guessed. Possibly Not. If not, then a method of storing the data temporarily, perhaps an endless belt with moveable pins as in the I.B.M. tape reader, will present the entire letter in its standard print shape. This has the advantage of making available symbols not too readily accessible to other devices, and also reducing the involved learning almost to the vanishing point since the vast majority of blind persons now know letter shapes. Many felt that hand feeding of the sensing head is not feasible, but that Battelle studies should be able to establish this in one way or the other. It was felt that existing Visagraph machines which provide tactile outputs should be subjected to further study.

The work of Mauch in Dayton which is VA subsidized, was mentioned briefly. It is Mauch's hope that a simple system for producing speech-like sounds can be applied to the Battelle type of device. The speech would resemble no existing language and would have to be learned, but might possibly be easier to learn than musical or unmusical tone patterns.

The proceedings were summarized at a final luncheon at the close of which the following observations were made:

1. Individuals with sufficient initiative and ingenuity have contrived a wide variety of devices and techniques and have demonstrated their potential in enriching practical technological aids.

2. A deficiency in communication has been underlined between blind persons of skill and ability, governmental and private agencies. A glaring weakness is in failure to have such data in the hands of vocational counsellors and placement officers.

3. The human engineering aspects came out as a highly significant factor. Too little is known of what the individual can do with ordinary tactile, auditory and other inputs. More knowledge in this area is essential to the intelligent development of new devices.

In closing, the speaker stated, "This is the first conference I know of in which there was this extensive participation of people who not only are blind but hold complicated technical jobs. This is the first time I have participated in such a conference. There is something wrong when in the long history of work for the blind this has not happened before. This is appalling. If this were to be the last time, that would be even more appalling. We can hope now that in the intervening period people in private and governmental agencies can be influenced by some of the points which have come out."

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